UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME : TRANSFORM CIRCUIT ANALYSIS

COURSE CODE : BEF22803

PROGRAMME : BEV

EXAMINATION DATE : JANUARY 2014

DURATION : 3 HOURS

INSTRUCTION : ANSWER **ALL** QUESTIONS

THIS QUESTIONS PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) **Figure Q1(a)** shows an output of a system. Write the function in terms of unit step functions and find the Laplace transform of the function.

(5 marks)

(b) Solve the Laplace transform of $f(t)$ below.

$$f(t) = \begin{cases} t^2 & 0 \leq t < 1 \\ t+2 & t \geq 1 \end{cases}$$

(10 marks)

(c) Given $x(t) = u(t)$, $h(t) = e^{-t}.u(t)$. Evaluate $y(4)$ where $y(t) = x(t)*h(t)$.

(10 marks)

Q2 (a) Find the inverse Laplace of the following:

(i) $s(s^2 + 4s + 6)^{-1}$

(ii) $\dfrac{se^{-8s}}{s^2-4s+3}$

(12 marks)

(b) On a semi log paper, sketch the Bode plot for

$$H(j\omega) = \frac{640(j\omega + 1)(0.01j\omega + 1)}{(j\omega)^2(j\omega + 10)}$$

(13 marks)

Q3 (a) **Figure Q3(a)** shows an RC circuit with an independent current source. Find an expression for $v(t)$.

(5 marks)

(b) In a circuit as shown in **Figure Q3(b)**, the switch is kept closed for a long time and opened at $t = 0$ s. Produce $v_o(t)$ using Laplace method.

(20 marks)

Q4 (a) A signal is given as:

$$f(x) = \begin{cases} 0 & -\pi < x < 0 \\ 1 & 0 < x < \pi \end{cases}$$

Construct the Fourier series of the above function.

(7 marks)

(b) Deduce the Fourier transform of $v_i(t) = 30e^{|t|}$ for $-\infty \leq t \leq +\infty$, as shown in **Figure Q4(b)**.

(5 marks)

(c) In **Figure Q4(c)**, produce $v_o(t)$ using Fourier method if the values of resistors R1 and R2 are 20 Ω and 80 Ω, respectively, while the value of capacitor C is 0.125 F.

(13 marks)

-END OF QUESTIONS-

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2013/2014   PROGRAMME : BEV
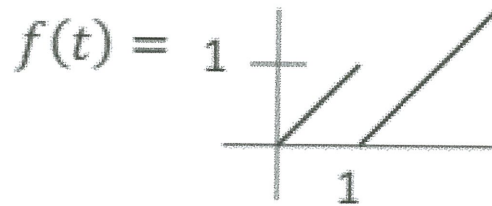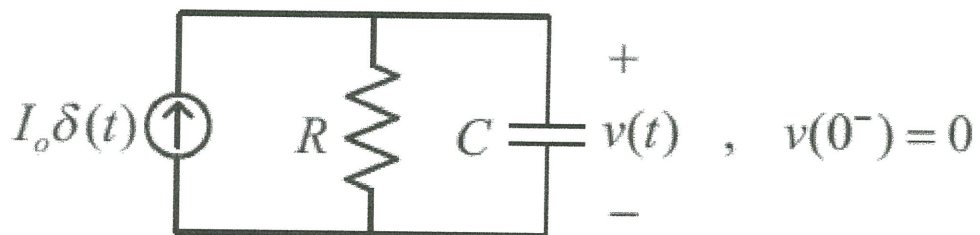COURSE NAME   : TRANSFORM CIRCUIT ANALYSIS   COURSE CODE : BEF 22803

$$f(t) = 1$$

FIGURE Q1(a)

$$I_o\delta(t) \quad R \quad C \quad v(t) \quad, \quad v(0^-) = 0$$

FIGURE Q3(a)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2013/2014   PROGRAMME : BEV
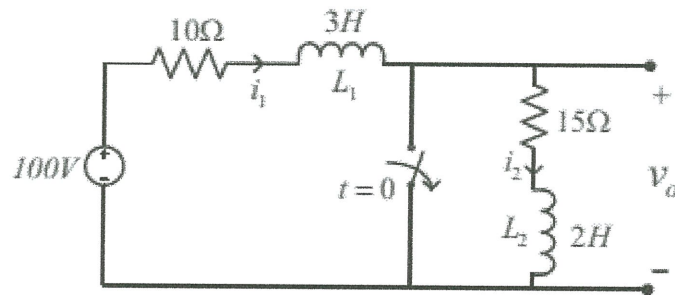COURSE NAME   : TRANSFORM CIRCUIT ANALYSIS   COURSE CODE : BEF 22803

FIGURE Q3(b)

FIGURE Q4(b)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2013/2014   PROGRAMME : BEV
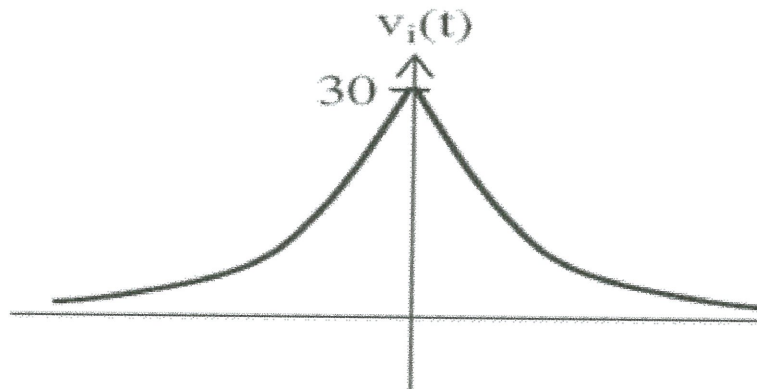COURSE NAME   : TRANSFORM CIRCUIT ANALYSIS   COURSE CODE : BEF 22803
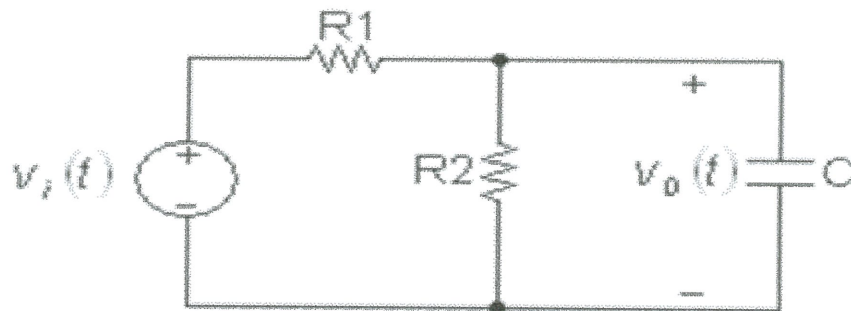

FIGURE Q4(c)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2013/2014   PROGRAMME : BEV
COURSE NAME : TRANSFORM CIRCUIT ANALYSIS   COURSE CODE : BEF 22803

Laplace Transform Table

	$f(t)$	$F(s)$	
1	1	$\dfrac{1}{s}$	$s > 0$
2	t	$\dfrac{1}{s^2}$	$s > 0$
3	t^n, n=1,2,…	$\dfrac{n!}{s^{n+1}}$	$s > 0$
4	e^{at}	$\dfrac{1}{s-a}$	$s > a$
5	$\sin at$	$\dfrac{a}{s^2+a^2}$	$s > 0$
6	os at	$\dfrac{s}{s^2+a^2}$	$s > 0$
9	$e^{at}\sin bt$	$\dfrac{b}{(s-a)^2+b^2}$	$s > a$
10	$e^{at}\cos bt$	$\dfrac{s-a}{(s-a)^2+b^2}$	$s > a$
11	$y'(t)$	$sY(s)-y(0)$, and $Y(s)=L\{y(t)\}$	
12	$y''(t)$	$s^2Y(s)-sy(0)-y'(0)$	
13	$e^{at}f(t)$	$F(s-a)$	
14	$t^n f(t)$, n=1,2,…	$(-1)^n\dfrac{d^n}{ds^n}F(s)$	
15	$f(t)u(t-a)$	$e^{-as}L\{f(t+a)\}$	